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ABSTRACT

This study was undertaken to ascertain the degree of stability of significant gains made in intellectual functioning by a group of children who attended Head Start programs and two groups of children who did not attend preschool programs. Data collected and analyzed at postkindergarten showed nonsignificant differences between performance levels of the experimental group and the control groups in intellectual functioning, the phonemes test and the letter names test. The experimental group performed significantly below one control group on the learning rate test. Data collected and analyzed at post-first grade showed nonsignificant differences between performance levels of the experimental group and the control group in intellectual functioning, on work study skills and arithmetic. The experimental group performed significantly below the control groups on paragraph meaning and vocabulary. (Author)

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## Abstract

This study was undertaken to ascertain the degree of stability of significant gains made in intellectual functioning by a group of children who attended Head Start programs and two groups of children who did not attend preschool programs. Data collected and analyzed at postkindergarten showed nonsignificant differences between performance levels of the experimental group and the control groups in intellectual functioning, the phonemes test and the letter names test. The expermental group performed significantly below one control group on the learning rate test. Data collected and analyzed at post-first grade showed nonsignificant differences between performance levels of the experimental group and the control group in intellectual functioning, on word study skills and arithmetic. The experimental group performed significantly below the control groups on paragraph meaning and vocabulary.


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# STABILITY OF GAINS IN INTELLECTUAL FUNCTIONING AMONG WHITE CHILDREN WHO ATTENDED A PRESCHOOL PROGRAM IN RURAL MINNESOTA

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Mankato, Minnesota

February, 1972

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## Introduction

Generally, recent studies show that disadvantaged children have made significant gains in intellectual functioning and related areas so they more closely approximate the measured levels of middle class children following intervention at the preschool age. Follow-up studies have been conducted to assess the stability of intellectual gains as the children move through the primary grades in school. Brittain (1968) reported loss of gains after two years as measured by the Stanford-Binet I.Q. scores, but no loss of gains on other non-intellectual scales. Wolff and Stein (1968) found that the initial advantage which Head Start children held when entering school had disappeared by the end of the first year in school. Brazziel (1968) reported that due to varied results in the persistence of I.Q. gains in Head Start programs follow-up studies are needed in other areas of learning.

This study was designed to extend over a period of five years in order to follow the educational progress of the children included in this sample from preschool through grade level three. In Phase I Larson (1969) collected data at the beginning and end of the period usually designated as the prekindergarten year in order to assess the effect of a preschool experience upon level of intellectual functioning. It was during this period that the experimental group attended Head Start programs whereas the control groups were not enrolled in a preschool program.

The subjects for this study consisted of 108 preschool age children (48 male, 60 female) with a mean chronological age of four years eight months residing in Brown County, Minnesota. The experimental group (Group X) was composed of 36 children, mean chronological age four years eight months, attending nine-month Head Start programs. The potential Head Start group (Control 1) was composed of 36 children, mean chronological age four years eight months, drawn from a pool of 45 eligible candidates for Head Start, but not attending a Head Start or preschool program. Eligibility for subjects in Control 1 to attend Head Start was determined by a committee composed of an elementary school principal, a kindergarten teacher, a school social worker, and a school nurse. A completely random group (Control 2) was composed of 36 children, mean chronological age four years eight months, drawn randomly from a pool of 132 children who were not enrolled in a preschool program. All subjects included in this study were eligible by chronological age to attend kindergarten classes during the fall of 1969.

In subsequent phases, academic progress of these children will be followed each year through data obtained from individual psychological tests, group achievement tests, and teacher evaluations.

Phase I results are summarized in Table 1 below.

TABLE 1
PHASE I STANFORD-BINET SCORES FOR THREE
PRESCHOOL GROUPS

| Group | Mean IQ 1968 Pre-test | Mean IQ 1969 Post-test | t |
|---|---|---|---|
| X | 98.56 | 108.58 | 2.9013** |
| C | 107.92 | 109.25 | .4765 |
| C | 109.30 | 109.28 | .0095 |

0.01 = **

The following conclusions were drawn from data collected in Phase I.

1. Groups of four-year-old white children residing in rural communities who do not attend a preschool program can seldom be expected to make significant gains in mean I.Q. scores.

2. Rural four-year-old children who attend a Head Start program as provided in Brown County made significant gains in mean I.Q. scores.

3. As a result of having attended a Head Start program, the level of intellectual functioning among four-year-old rural children increased to more closely approximate the level of randomly selected children who did not attend a preschool program.

PHASE II

Method

Subjects for this follow-up study consisted of 94 children remaining of the 108 studied in Phase I who had attended kindergarten in eleven classrooms in public and parochial schools in rural Minnesota. The experimental group (X) was composed of 28 children who had attended Head Start classes at the preschool level. One control group (C-1) was composed of 34 children who were considered eligible for Head Start, but did not attend a Head Start or preschool program. The other control group (C-2) was composed of 32 children drawn randomly and were not enrolled in a preschool program at the preschool level. All subjects included in this study were eligible to enter first grade in the fall of 1970.

The purpose of Phase II was to assess the stability of mean gains made in intellectual functioning by the experimental group following an intervention as provided by Head Start programs and mean scores in intellectual functioning attained at postkindergarten level as well as the stability of gains in intellectual functioning among the control

groups who did not attend a preschool program. In addition, a comparison was made of mean scores obtained on a reading readiness test among the experimental group and control groups following kindergarten. The following questions were asked.

1. Is there a significant difference between the stability of mean scores on an individual intelligence test attained at prekindergarten level and mean scores obtained at postkindergarten level by children who attended Head Start programs and children who did not attend a preschool program?

2. Is there a significant difference between mean scores obtained on a reading readiness test at the postkindergarten level by children who attended Head Start programs at the preschool level and children who did not attend a preschool program?

## Results

In order to determine the stability of mean gains in intellectual functioning made in Phase I, the 1960 Stanford-Binet Intelligence Scale was administered to all children included in the sample during late summer of 1970. A comparison of each group's mean performances in Phase II to their mean performance in the post-test Phase I is shown in Table 2.

TABLE 2
STANFORD-BINET SCORES FOR THREE GROUPS

| Group | 1969 Post-test Phase I Mean IQ | 1970 Phase II Mean IQ | t |
|---|---|---|---|
| X | 109.57 | 105.25 | 1.54 |
| C-1 | 108.94 | 109.71 | .29 |
| C-2 | 109.91 | 109.13 | .43 |

Group X obtained a mean score of 109.57 IQ points in the post-test Phase I and a mean score of 105.25 IQ points in Phase II, showing a nonsignificant loss of 4.32 IQ points. Group C-1 obtained a mean score of 108.94 IQ points in the post-test Phase I and a mean score of 109.71 IQ points in Phase II, for a nonsignificant gain of 0.77 IQ points. Group C-2 obtained a mean score of 109.91 IQ points in the post-test Phase I and a mean score of 109.13 IQ points on Phase II, for a nonsignificant loss of 0.78 points. All differences among groups were found to be not significant at the .05 confidence level.

The Murphy-Durrell Reading Readiness Analysis (1965) was administered to the sample previous to entering first grade to assess other areas of learning. This instrument provides inventories of abilities in phoneme perception and letter names, and a test of learning rate for new words to aid pupil grouping and to assist in predicting year-end reading achievement. The Phonemes Test is composed of 24 items to inventory the child's ability to identify sounds in spoken words. The Letter Names Test contains 52 items to measure ability to identify upper and lower case letters. The Learning Rate Test uses 18 items to measure the number of words a child can learn to recognize in a one-hour period.

The Murphy-Durrell Analysis test was administered to the three groups of this study in the fall of 1970; the results are reported in Tables 3, 4, and 5 below.

TABLE 3
GROUP SCORES ON PHONEMES TEST

| Group | Mean | Group | Mean | t |
|---|---|---|---|---|
| X | 37.41 | C-1 | 40.94 | 1.80 |
| C-1 | 40.94 | C-2 | 37.68 | 1.66 |
| C-2 | 37.68 | X | 37.41 | .14 |

TABLE 4
GROUP SCORES ON LETTER NAMES TEST

| Group | Mean | Group | Mean | t |
|---|---|---|---|---|
| X | 45.37 | C-1 | 49.74 | 1.37 |
| C-1 | 49.74 | C-2 | 50.39 | 1.16 |
| C-2 | 50.39 | X | 45.37 | 1.65 |

TABLE 5
GROUP SCORES ON LEARNING RATE TEST

| Group | Mean | Group | Mean | t |
|---|---|---|---|---|
| X | 13.44 | C-1 | 15.47 | 2.31 |
| C-1 | 15.47 | C-2 | 15.77 | 2.14 |
| C-2 | 15.77 | X | 13.44 | 2.56* |

.05 = *

The results of the analysis of data gathered from the Murphy-Durrell are as follows:

1. On the Phonemes Test, Group X obtained a mean score of 37.41; Group C-1, 40.94; and Group C-2, 37.68. The difference between Group X and Group C-1 was 3.54 and was not significant. The difference between Group X and Group C-2 was 0.27 and was not significant. The difference between Group C-1 and Group C-2 was 3.26 and was not significant.

2. On the Letter Names Test, Group X obtained a mean score of 45.37; Group C-1, 49.74; and Group C-2, 50.39. The difference between Group X and Group C-1 was 4.37 and was not significant. The difference between Group X and Group C-2 was 5.02 and was not significant. The difference between Group C-1 and Group C-2 was 0.65 and was not significant.

3. On the Learning Rate Test, Group X obtained a mean score of 13.44; Group C-1, 15.47; and Group C-2, 15.77. The difference between Group X and Group C-1 was 2.03 and was not significant. The difference between Group X and Group C-2 was 2.33 and was significant. The difference between Group C-1 and Group C-2 was 0.30 and was not significant.

From the above findings it is appropriate to draw the following conclusions:

1. Mean gains in intellectual functioning made by children who attended Head Start programs show no significant deterioration at the postkindergarten level.

2. The level of intellectual functioning established by groups of children who did not attend a Head Start program remained stable at the postkindergarten level.



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3. The performance level (Murphy-Durrell) on phonemes and letter names of children who attended Head Start programs and randomly assigned groups of children did not differ significantly.

4. The significant differences between children who attended Head Start programs and a group of randomly assigned children on the Learning Rate Test points to a deficit in learning among children who attended Head Start programs.

PHASE III

Method

The purpose of Phase III was to determine the level of stability of mean gains in intellectual functioning made at the end of the preschool year (post-test Phase I) and level of intellectual functioning at the end of first grade (Phase III) among groups included in this study. In order to establish baseline data in other areas of learning, a standardized group achievement test was administered and a comparison was made of mean standard scores among the experimental group and the control groups. The following questions were asked.

1. Is there a significant difference between the level of stability in intellectual functioning of children at post-test Phase I and Phase III of children who attended Head Start programs and children who did not attend a preschool program?

2. Is there a significant difference between mean scores obtained on a group achievement test at the post-first grade level by children who attended Head Start programs at the preschool level and children who did not attend a preschool program?

The sample for Phase III consisted of 91 children remaining of the 94 studied in Phase II who had attended first grade in 13 classrooms in public and parochial schools in rural Minnesota. The experimental group (X) was composed of 27 children who had attended Head Start classes at the preschool level. One control group (C-1) was composed of 33 children who were considered eligible for Head Start, but did not attend a Head Start or preschool program. The other control group (C-2) was composed of 31 children drawn randomly and were not enrolled in a preschool program. All subjects included in this study completed first grade in the spring of 1971.

Results

As mentioned earlier, the primary intent of this study was to investigate the stability of mean gains in intellectual functioning made at the end of the preschool year (post-test Phase I) and level of intellectual functioning at the end of first grade (Phase III) among groups included in this study. Data obtained on the Stanford-Binet during Phase III are reported in Tables 6 and 7.

TABLE 6
PHASE III STANFORD-BINET SCORES

| Group | Mean | Group | Mean | t |
|---|---|---|---|---|
| X | 106.63 | C-1 | 111.70 | 1.72 |
| C-1 | 111.70 | C-2 | 111.58 | 0.07 |
| C-2 | 111.58 | X | 106.63 | 1.72 |

TABLE 7
SUMMARY OF PHASE I POST-TEST AND PHASE III TEST FINDINGS
AND MEAN DIFFERENCES IN STANFORD-BINET SCORES FOR
ALL IQ SCORES WITHIN GROUPS

| | | Post-test Phase I | | Phase III | | |
|---|---|---|---|---|---|---|
| Group | N | Mean IQ | SD | Mean IQ | SD | t |
| X | 27 | 109.04 | 13.80 | 106.63 | 9.96 | .74 |
| C-1 | 33 | 108.88 | 11.88 | 111.70 | 12.36 | 1.29 |
| C-2 | 31 | 109.71 | 11.57 | 111.58 | 11.69 | .94 |

The results of the analysis of data collected to answer the questions posed earlier are as follows:

1. A comparison of mean performance scores of each group included in the study is shown in Table 6. Group X obtained a mean performance score of 106.63 I.Q. points; Group C-1, 111.70 I.Q. points; and Group C-2, 111.58 I. Q. points. The difference between Group X and Group C-1 was 5.07 points, a nonsignificant difference at the .05 level of confidence; between Group X and Group C-2, 4.95 I.Q. points, nonsignificant; and between Group C-1 and Group C-2, 0.22 I.Q. points, nonsignificant.

2. A comparison of each group's mean performances in Phase III to their mean performances in Phase I post-test is shown in Table 7. Group X obtained a mean score of 109.04 I.Q. points in the post-test of Phase I and a mean score of 106.63 I.Q. points in Phase III, showing a nonsignificant loss of 2.41 I.Q. points. Group C-1 obtained a post-test Phase I mean score

of 108.88 I.Q. points and a Phase III mean score of 111.70 I.Q. points for a nonsignificant gain of 2.82 I.Q. points. Group C-2 obtained a post-test Phase I mean score of 109.71 I.Q. points and a Phase III mean score of 111.58 I.Q. points for a nonsignificant gain of 1.87 I.Q. points.

The Stanford Achievement Test, Primary I Battery (1965), was administered to the children included in the sample at the end of first grade. This battery was designed to provide an objective measurement of achievement level of pupils in reading, arithmetic, and spelling and yields scores in word reading, which measures ability to analyze words; paragraph meaning, which measures comprehension; vocabulary, which measures vocabulary independent of reading skills; word study skills, which measures level of auditory perception, phonics and ability to match words; and arithmetic, which involves ability in measurement problem solving and number concepts. Results of the Stanford Achievement Test are reported in Table 8.

TABLE 8
STANFORD ACHIEVEMENT TEST MEAN STANDARD SCORES

| Subtest | Group X | Group C-1 | Group C-2 | t |
|---|---|---|---|---|
| Word Reading | 22.85 | 26.45 | | 2.06* |
| | 22.85 | | 26.00 | 1.85 |
| | | 26.45 | 26.00 | .31 |
| Paragraph Meaning | 21.62 | 26.82 | | 3.47** |
| | 21.62 | | 26.52 | 2.99** |
| | | 26.82 | 26.52 | .20 |
| Vocabulary | 21.38 | 29.59 | | 3.19** |
| | 21.38 | | 26.00 | 2.64* |
| | | 29.59 | 26.00 | 1.34 |
| Word Study Skills | 26.69 | 33.41 | | 1.56 |
| | 26.69 | | 32.22 | 1.54 |
| | | 33.41 | 32.22 | .32 |
| Arithmetic | 25.23 | 20.27 | | 1.11 |
| | 25.23 | | 21.17 | .91 |
| | | 20.27 | 21.17 | .70 |

.05 = *
.01 = **

The results of analysis of data obtained on the Stanford Achievement Test follows:

1. Comparisons between each group's mean performances on word reading shows Group X was significantly below Group C-1 at the .05 level of confidence.

2. On paragraph meaning Group X performed significantly below the control groups at the .01 level of confidence.

3. On vocabulary Group X performed significantly below Group C-1 at the .01 level of confidence and below Group C-2 at the .05 level.

4. Comparisons of group mean performances on word study skills and arithmetic show no significant differences among the groups.

## Conclusions and Implications

From the above findings the following conclusions are drawn:

1. Mean gains made in intellectual functioning by children who attended Head Start programs during Phase I have remained stable through completion of first grade.

2. In Phase II (post-kindergarten) children who had attended Head Start programs performed significantly below a randomly selected group who did not attend preschool on the Learning Rate Test.

3. In Phase III (post-first grade) children who had attended Head Start programs performed significantly below the control groups on subtests in word reading, paragraph meaning, vocabulary, and spelling. On word study skills and arithmetic, there was no significant differences in mean performances among groups.

The three phases of this study confirm findings of other researchers who have studied the stability of gains made in intellectual functioning as a result of attending Head Start programs. The level of intellectual functioning of white children who attended a preschool program in rural Minnesota remains stable through grade one; nevertheless, deficits in school learning tasks, word reading, paragraph meaning, and vocabulary emerge.

Given the relatively stable performance in level of intellectual functioning over the three year period and relatively poor performance on the school learning tasks alluded to above certain questions arise.

1. Would an expanded effort by rural school districts result in better acquisition in basic study skills?

2. Would a rural school program emphasizing parent involvement and reinforcement of the school's teaching effort have a salutory effect?

3. Do nonintellectual factors such as attention span and distractibility penalize disadvantaged rural children in a large group learning situation?

4. Would individual achievement testing tend to reduce discrepancies between disadvantaged and their counterparts from other economic groups?

5. Does the nonsignificant decline in intellectual functioning portend the buildup of a cumulative deficit which eventually will be reflected by significant differences in cognitive strengths?

At this time these and other questions are unanswered, but rural communities continue to face the problem of developing adequate educational services for all children.

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